Microsoft

2: Explore fundamentals of relational data in Azure

© Copyright Microsoft Corporation. All rights reserved.

Agenda

- Explore relational data concepts
- Explore Azure services for relational data

© Copyright Microsoft Corporation. All rights reserved.

Learning objectives

After completing this module, you will be able to:

1. Identify characteristics of relational data.
2. Define normalization.
3. Identify types of SQL statements and relational database objects.
4. Identify options for Azure SQL services.
5. Identify options for open-source databased in Azure.
6. Provision a database service on Azure.

© Copyright Microsoft Corporation. All rights reserved.

1: Explore relational data concepts

© Copyright Microsoft Corporation. All rights reserved.

Relational tables

- Data is stored in tables
- Tables consists of rows and columns
- All rows have the same columns
- Each column is assigned a datatype

Customer

ID	FirstName	MiddleName	LastName	Email	Address	City
1	Joe	David	Jones	joe@litware.com	1 Main St.	Seattle
2	Samir		Nadoy	samir@northwind.com	123 Elm Pl.	New York

Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Order

OrderNo	OrderDate	Customer
1000	1/1/2022	1
1001	1/1/2022	2

LineItem

OrderNo	ItemNo	ProductID	Quantity
1000	1	123	1
1000	2	201	2
1001	1	123	2

© Copyright Microsoft Corporation. All rights reserved.

Normalization

Sales Data				
OrderNo	**OrderDate**	**Customer**	**Product**	**Quantity**
1000	1/1/2022	Joe Jones, 1 Main St, Seattle	Hammer ($2.99)	1
1000	1/1/2022	Joe Jones- 1 Main St, Seattle	Screwdriver ($3.49)	2
1001	1/1/2022	Samir Nadoy, 123 Elm Pl, New York	Hammer ($2.99)	2
…	…	…	…	…

- Separate each *entity* into its own table
- Separate each discrete *attribute* into its own column
- Uniquely identify each entity instance (row) using a *primary key*
- Use *foreign key* columns to link related entities

Customer				
ID	**FirstName**	**LastName**	**Address**	**City**
1	Joe	Jones	1 Main St.	Seattle
2	Samir	Nadoy	123 Elm Pl.	New York

Product		
ID	**Name**	**Price**
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Order		
OrderNo	**OrderDate**	**Customer**
1000	1/1/2022	1
1001	1/1/2022	2

LineItem			
OrderNo	**ItemNo**	**ProductID**	**Quantity**
1000	1	123	1
1000	2	201	2
1001	1	123	2

© Copyright Microsoft Corporation. All rights reserved.

Structured Query Language (SQL)

- SQL is a standard language for use with relational databases
- Standards are maintained by ANSI and ISO
- Most RDBMS systems support proprietary extensions of standard SQL

Data Definition Language (DDL)	Data Control Language (DCL)	Data Manipulation Language (DML)
CREATE, ALTER, DROP, RENAME	*GRANT, DENY, REVOKE*	*INSERT, UPDATE, DELETE, SELECT*

`CREATE TABLE Product`
`(`
`  ProductID INT PRIMARY KEY,`
`  Name VARCHAR(20) NOT NULL,`
`  Price DECIMAL NULL`
`);`
	`GRANT SELECT, INSERT, UPDATE`
	`ON Product`
	`TO user1;`
		`SELECT Name, Price`
		`FROM Product`
		`WHERE Price > 2.50`
		`ORDER BY Price;`

Product

ID	Name	Price

Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Name	Price
Hammer	2.99
Screwdriver	3.49
Wrench	4.25

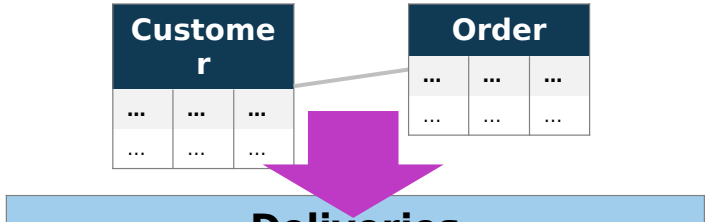
© Copyright Microsoft Corporation. All rights reserved.

Other common database objects

Views

Pre-defined SQL queries that behave as virtual tables

```
CREATE VIEW Deliveries
AS
SELECT o.OrderNo, o.OrderDate,
       c.Address, c.City
FROM Order AS o JOIN Customer AS c
ON o.Customer = c.ID;
```



Deliveries

OrderNo	OrderDate	Address	City
1000	1/1/2022	1 Main St.	Seattle
1001	1/1/2022	123 Elm Pl.	New York

Stored Procedures

Pre-defined SQL statements that can include parameters

```
CREATE PROCEDURE RenameProduct
          @ProductID INT,
          @NewName VARCHAR(20)
AS
UPDATE Product
SET Name = @NewName
WHERE ID = @ProductID;
...
EXEC RenameProduct 201, 'Spanner';
```

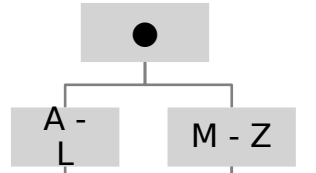
Product

ID	Name	Price
201	~~Wrench~~ **Spanner**	4.25

Indexes

Tree-based structures that improve query performance

```
CREATE INDEX idx_ProductName
ON Product(Name);
```



Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Spanner	4.25

© Copyright Microsoft Corporation. All rights reserved.

1: Knowledge check

1 Which one of the following statements is a characteristic of a relational database?

- ◌ All columns in a table must be of the same data type
- ◌ A row in a table represents a single instance of an entity
- ◌ Rows in the same table can contain different columns

2 Which SQL statement is used to query tables and return data?

- ◌ QUERY
- ◌ READ
- ◌ SELECT

3 What is an index?

- ◌ A structure that enables queries to locate rows in a table quickly
- ◌ A virtual table based on the results of a query
- ◌ A pre-defined SQL statement that modifies data

© Copyright Microsoft Corporation. All rights reserved.

1: Knowledge check

1 Which one of the following statements is a characteristic of a relational database?

- ○ All columns in a table must be of the same data type
- ✔ A row in a table represents a single instance of an entity
- ○ Rows in the same table can contain different columns

2 Which SQL statement is used to query tables and return data?

- ○ QUERY
- ○ READ
- ✔ SELECT

3 What is an index?

- ✔ A structure that enables queries to locate rows in a table quickly
- ○ A virtual table based on the results of a query
- ○ A pre-defined SQL statement that modifies data

© Copyright Microsoft Corporation. All rights reserved.

2: Explore Azure services for relational data

© Copyright Microsoft Corporation. All rights reserved.

Azure SQL

Family of SQL Server based cloud database services

SQL Server on Azure VMs

- Guaranteed compatibility to SQL Server on premises
- Customer manages everything – OS upgrades, software upgrades, backups, replication
- Pay for the server VM running costs and software licensing, not per database
- Great for hybrid cloud or migrating complex on-premises database configurations

Azure SQL Managed Instance

- Near 100% compatibility with SQL Server on-premises
- Automatic backups, software patching, database monitoring, and other maintenance tasks
- Use a single instance with multiple databases, or multiple instances in a pool with shared resources
- Great for migrating most on-premises databases to the cloud

Azure SQL Database

- Core database functionality compatibility with SQL Server
- Automatic backups, software patching, database monitoring, and other maintenance tasks
- *Single database* or *elastic pool* to dynamically share resources across multiple databases
- Great for new, cloud-based applications

IaaS

PaaS

© Copyright Microsoft Corporation. All rights reserved.

Azure Database services for open-source

Azure managed solutions for common open-source RDBMSs

Azure Database for MySQL

- PaaS implementation of MySQL in the Azure cloud, based on the MySQL Community Edition
- Commonly used in Linux, Apache, MySQL, PHP (LAMP) application architectures

Azure Database for MariaDB

- An implementation of the MariaDB Community Edition database management system adapted to run in Azure
- Compatibility with Oracle Database

Azure Database for PostgreSQL

- Database service in the Microsoft cloud based on the PostgreSQL Community Edition database engine
- Hybrid relational and object storage

PaaS

© Copyright Microsoft Corporation. All rights reserved.

2: Knowledge check

1 Which deployment option offers the best compatibility when migrating an existing SQL Server on-premises solution?

- ◌ Azure SQL Database (single database)
- ◌ Azure SQL Database (elastic pool)
- ◌ Azure SQL Managed Instance

2 Which of the following statements is true about Azure SQL Database?

- ◌ Most database maintenance tasks are automated
- ◌ You must purchase a SQL Server license
- ◌ It can only support one database

3 Which database service is the simplest option for migrating a LAMP application to Azure?

- ◌ Azure SQL Managed Instance
- ◌ Azure Database for MySQL
- ◌ Azure Database for PostgreSQL

© Copyright Microsoft Corporation. All rights reserved.

2: Knowledge check

1 Which deployment option offers the best compatibility when migrating an existing SQL Server on-premises solution?

- ○ Azure SQL Database (single database)
- ○ Azure SQL Database (elastic pool)
- ✔ Azure SQL Managed Instance

2 Which of the following statements is true about Azure SQL Database?

- ✔ Most database maintenance tasks are automated
- ○ You must purchase a SQL Server license
- ○ It can only support one database

3 Which database service is the simplest option for migrating a LAMP application to Azure?

- ○ Azure SQL Managed Instance
- ✔ Azure Database for MySQL
- ○ Azure Database for PostgreSQL

© Copyright Microsoft Corporation. All rights reserved.

© Copyright Microsoft Corporation. All rights reserved.